AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A switching power supply comprising:

a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

a smoothing circuit smoothing a voltage developed across a secondary winding of the transformer; and

a control circuit alternately turning on and turning off the first and second switches,

wherein the transformer, formed with a magnetic circuit includes[[;]] :

a main core, made of magnetic material, ~~on~~ in which the ~~primary and~~ secondary ~~windings are~~ winding is lap-wound ~~wound~~ on the primary winding with a given gap; and

a plurality of auxiliary cores, made of magnetic material, which are disposed in the given gap with a given distance in a circumferential direction of the primary winding, ~~and~~

wherein the reactor is formed of a leakage inductance of the transformer, the leakage inductance having a value set by adjusting a number of the auxiliary cores or a length of the auxiliary cores, and

wherein the plurality of auxiliary cores are provided on the transformer to leak a part of a magnetic flux generated by the main core.

2. (Original) The switching power supply according to claim 1,

wherein the transformer includes: a cylindrical inner bobbin on which the primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the secondary winding is wound, and having a plurality of slits, formed in a given distance along the circumferential direction, which accommodate the plurality of auxiliary cores, respectively, and

wherein the inner bobbin is mounted to the main core under a condition where the inner bobbin is inserted to the outer bobbin.

3. (Currently Amended) A switching power supply comprising:

a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

a smoothing circuit smoothing a voltage developed across a secondary winding of the transformer; and

a control circuit alternately turning on and turning off the first and second switches,

wherein the transformer, formed with a magnetic circuit, includes a main core, made of magnetic material, that has:

a cylindrical inner bobbin on which the primary winding is wound; and

an outer bobbin, having a diameter larger than that of the inner bobbin, on which the secondary winding is wound, the outer bobbin being made of an insulating magnetic material, and

wherein the inner bobbin is mounted to the main core under a condition where the inner bobbin is inserted to the outer bobbin thereby the secondary winding is lap-wound on the primary winding via the insulating magnetic material, ~~and~~

wherein the reactor is formed of a leakage inductance of the transformer, the leakage inductance having a value set by adjusting a magnetic permeability of the insulting magnetic material, and

wherein the insulating magnetic material is provided on the transformer to leak a part of a magnetic flux generated by the main core.

4. (Currently Amended) A switching power supply comprising:

a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

a smoothing circuit smoothing a voltage developed across a secondary winding of the transformer;

a control circuit alternately turning on and turning off the first and second switches; and

a feedback winding, located on a secondary side of the transformer, which allows energy stored in the reactor when the first switch is turned on to be circulated to the secondary side when the first switch is turned off,

wherein the transformer, formed with a magnetic circuit, including:

a main core, made of magnetic material and formed with a mirror E-shape, that has[[;]] :

a central leg on which the primary winding of the transformer is wound, ~~and~~ the feedback winding ~~are~~ being lap-wound ~~wound~~ on the primary winding with a first given gap;

a first side core formed with a second given gap, and

a second side core on which the secondary winding of the transformer is wound; and

a plurality of auxiliary cores, made of magnetic material, which are disposed in the first given gap with a given distance in a circumferential direction of the primary winding, ~~and~~

wherein the reactor is formed of a leakage inductance of the transformer, the leakage inductance having a value set by adjusting a number of the auxiliary cores or a length of the auxiliary cores, and

wherein the plurality of auxiliary cores are provided on the transformer to leak a part of a magnetic flux generated by the main core.

5. (Original) The switching power supply according to claim 4,

wherein the transformer includes; a cylindrical inner bobbin on which the primary winding is wound; and an outer bobbin having a diameter larger than that of the inner bobbin on which the feedback winding is wound, and having a plurality of slits, formed in a given distance in the circumferential direction, which accommodate the plurality of auxiliary cores, respectively, and

wherein the inner bobbin is mounted to the central leg of the main core under a condition where the inner bobbin is inserted to the outer bobbin.

6. (Currently Amended) A switching power supply comprising:

a first series circuit, connected to both terminals of a direct current power supply, in which a primary winding of a transformer, a reactor, and a first switch are connected in series;

a second series circuit, connected to one of both terminals of the first switch and both terminals of the primary winding and the reactor, in which a second switch and a capacitor are connected in series;

a smoothing circuit smoothing a voltage developed across a secondary winding of the transformer;

a control circuit alternately turning on and turning off of the first and second switches; and

a feedback winding, located on a secondary side of the transformer, which allows energy stored in the reactor when the first switch is turned on to be circulated to the secondary side when the first switch is turned off,

wherein the transformer, formed with a magnetic circuit includes

a main core, made of magnetic material and formed with a mirror E-shape, that has:

a central leg mounted with a cylindrical inner bobbin on which the primary winding is wound and an outer bobbin, having a diameter larger than that of the inner bobbin, on which the feedback winding is wound, the outer bobbin being made of an insulating magnetic material, and

wherein the inner bobbin is mounted to the central leg of the main core under a condition where the inner bobbin is inserted to the outer bobbin thereby the feedback winding is lap-wound on the primary winding via the insulating magnetic material,

a first side core formed with a given gap, and

a second side core on which the secondary winding of the transformer is wound; ~~and~~

wherein the reactor is formed of a leakage inductance of the transformer, the leakage inductance having a value set by adjusting a magnetic permeability of the insulting magnetic material; and

wherein the insulating magnetic material is provided on the transformer to leak a part of a magnetic flux generated by the main core.

7. (Previously Presented) The switching power supply according to claim 1, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.

8. (Previously Presented) The switching power supply according to claim 2, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.

9. (Previously Presented) The switching power supply according to claim 3, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.

10. (Previously Presented) The switching power supply according to claim 4, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.

11. (Previously Presented) The switching power supply according to claim 5, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.

12. (Previously Presented) The switching power supply according to claim 6, further comprising:

a saturable reactor connected to both terminals of the primary winding of the transformer to utilize a saturable characteristic of the core of the transformer,

wherein the control circuit turns off the second switch when a current of the second switch increases.